

irradiated on the screen: parallel to a vertical cross section of the screen; parallel to a horizontal cross section of the screen; parallel to a plane including the image light irradiated on the screen and a normal of the screen." The Office Action cited Suzuki to cure the deficiencies which exist in Shikama.

Applicants respectfully traverse this rejection and submit that each of claims 1-8, 11, 13-21, 24, 26-33, 36 and 38 recites subject matter which is neither disclosed nor suggested in the cited prior art.

Claim 1, upon which claims 2-13 are dependent, recites a rear projection display device having a light source lamp, a color splitting means for splitting light emitted from the light source lamp into a plurality of color components, and a plurality of liquid crystal panels for optically modulating each color light split by the color splitting means. The rear projection display device further includes a color synthesizing means for synthesizing each of the color light modulated by the liquid crystal panels, and a projection means for projecting image light which is color-synthesized by the color synthesizing means on a screen from slantly above or from slantly below. The polarization direction of at least one color component out of the image light irradiated onto the screen is parallel to a vertical cross section of the screen.

Claim 14, upon which claims 15-26 are dependent, recites a rear projection device similar to the device recited in claim 1 with the exception that the projection means for projecting image light is color-synthesized by the color synthesizing means on a screen from a slant side. Also, the polarization direction of at least one color component out of the image light irradiated on the screen is parallel to a horizontal cross section of the screen.

Claim 27, upon which claims 28-38 are dependent, recites a rear projection display device similar to the display device recited in claim 1 with the exception that the projection means slantly projects image light which is color-synthesized by the color synthesizing means on a screen. The polarization direction of at least one color component out of the image light irradiated on the screen is parallel to a plane including the image light irradiated on the screen in a normal of the screen.

Accordingly, the present invention is directed to a rear projection display device which enables an observer to observe a picture on the front surface of a screen by projecting image light onto the back surface of the screen from a slant. Furthermore, the present invention provides a rear projection device capable of improving the brightness and the image quality of the picture by improving the utilization efficiency of the image light which is projected onto the screen from a slanted angle.

It is respectfully submitted that the prior art fails to disclose or suggest at least the elements of "a polarization direction of at least one color component out of the image light irradiated on the screen: parallel to a vertical cross section of the screen; parallel to a horizontal cross section of the screen; parallel to a plane including the image light irradiated on the screen and a normal of the screen" as recited in the presently pending claims, and therefore fails to provide the advantages which are provided by the present invention.

Shikama discloses a projector 300 comprising a light source 1 with lamp 120 and parabolic mirror 130 that directs white light toward dichroic mirrors 14B and 14G. The projector 300 also comprises mirrors 11a, 11b and 11c, liquid crystal display panels 3R, 3G and 3B, a dichroic prism 15, a projection lens 4, and a reflecting, front projection screen

5F. The lamp 120 is at the focal point of the parabolic mirror 130 to produce a collimated beam of white light. The dichroic mirror 14B transmits red and green light, but reflects blue light. The dichroic mirror 14G reflects green light but transmits red light. By means of the dichroic mirrors 14B and 14G, white light 2 is decomposed into three primary colors. The mirrors 11A and 11B reflect red light, the dichroic mirror 14B and the mirror 11C reflect blue light, and the dichroic mirror 14G reflects green light. The reflected light is directed to the respective one of the liquid crystal display panel 3R, 3G and 3B, each of which produces a monochromatic image of the respective color under control of an operating circuit.

Suzuki discloses a projection type display using a transmission type liquid crystal light valve, capable of exhibiting a high quality gradation display by preventing a leak current at a switching device. Suzuki discloses three liquid crystal light valves which have polarizing plates that are modulated in intensity and emit each light of color components red, green and blue, and a dichroic prism to synthesize exiting lights from the respective light valves. The projection type display is also structured to arrange half-wave plates between the liquid crystal light valves to set a polarizing direction of an exiting light of a blue component orthogonal to polarizing directions of the other two existing lights. In addition, Suzuki discloses that each light of the three primary colors has a polarizing direction that is parallel and is incident on the dichroic prism after being incident on each of the liquid crystal light valves and corresponding to each color and modulated corresponding to the image signal.

Applicants respectfully submit that each and every element recited within claims 1, 14 and 27 of the present application is neither disclosed nor suggested by Shikama and/or

Suzuki, taken alone or in combination. In particular, Applicants submit that the rear projection display device as recited in the present application is clearly distinct from that which is illustrated in the cited prior art. Specifically, it is submitted that neither Shikama nor Suzuki, taken alone or in combination, disclose or suggest at least the limitations of a polarization direction of at least one color component out of the image light irradiated on the screen: parallel to a vertical cross section of the screen; parallel to a horizontal cross section of the screen; parallel to a plane including the image light irradiated on the screen and a normal of the screen.

Applicants submit that the present invention focuses on eliminating a ghost which appears on a screen in a rear projection display device. Since a man is likely to recognize green light brighter in comparison with red or blue light, when the image light is slantly projected, the reflectivity of the brightest green light increases, and therefore the brightness as a whole is lowered. The image quality is degraded because of the reflected light (from line 18, page 4 to line 2, page 5 of the specification). The ghost phenomenon is thus caused by the reflected light and the present invention discloses the following physical conditions to prevent such phenomenon.

1. The green light is set to be P-polarized light to the screen. In the present invention, P-polarized direction is parallel to the y-z plane as shown in the Figs. 3-5 and discussed on lines 19-20, page 21 of the specification.

2. Optical conditions are adjusted so that a maximum value  $i\text{-max}$  and a minimum value  $i\text{-min}$  of an incident angle  $i$  is formed by a normal of a back surface of the screen and a principal ray of light incident to the screen, and an angle  $\alpha$  is obtained when

the reflectivity of light to the back surface of the screen is minimum to satisfy the relationship of  $i_{\min} < \alpha < i_{\max}$ .

3. An inclined surface with a ring body shaped protrusion of the fresnel lens is adjusted so that a maximum value  $j_{\max}$  and a minimum value  $j_{\min}$  of an incident angle  $j$  is formed by a normal of a front surface of the screen and a principal ray of light incident to the screen, and an angle  $\beta$  is obtained when the reflectivity of light to the front surface of the screen is minimum to satisfy the relationship of  $j_{\min} < \beta < j_{\max}$ .

In contrast, Shikama, Suzuki and Shibazaki, taken alone or in combination, do not disclose or suggest a ghost on the screen being relevant to the relations between a structure as well as a surface shape of the screen and image light rays. Applicants submit that the cited prior art fails to disclose the detailed and concrete conditions as recited in the claimed invention. The present application clearly defines the concrete conditions based on the relationships between a surface shape of the screen, the image light rays and a polarization direction of a color component out of the image light. Therefore, Applicants submit that the present invention is novel and non-obvious to an ordinary person skilled in the art, and therefore is patentable over the cited references.

As for claims 2-8, 11, 13, 15-21, 24, 26, 28-33, 36 and 38, Applicants submit that each of these claims recites subject matter which is neither disclosed nor suggested by the cited prior art. In particular, each of these claims depends on claims 1, 14 and 27, respectively. Therefore, each of claims 2-8, 11, 13, 15-21, 24, 26, 28-33, 36 and 38 incorporates each and every limitation recited within claims 1, 14 and 27, respectively therein. Therefore, Applicants respectfully submit that each of claims 2-8, 11, 13, 15-21, 24, 26, 28-33, 36 and 38 also recites subject matter which is neither disclosed nor

suggested by Shikama and/or Suzuki, for at least the reasons set forth above with respect to claims 1, 14 and 27.

Claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shikama in view of Suzuki as applied to claims 1-8, 11, 13-21, 24, 26-33, 36 and 38 and further in view of Shibazaki (U.S. Patent No. 5,477,394). Applicants respectfully traverse this rejection and submit that each of claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 recites subject matter which is neither disclosed nor suggested in the cited prior art.

Shibazaki discloses a projector comprising a light valve, a converging lens, a plane mirror, an elliptical mirror, a projection lens and a parabolic mirror. Shibazaki also discloses a Fresnel lens and a lenticular lens-screen. The elliptical mirror of Shibazaki has a primary focal point and a secondary focal point that is also a focal point of the parabolic mirror.

Applicants respectfully submit that each and every element recited within each of claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 is neither disclosed nor suggested by the combination of Shikama, Suzuki, and Shibazaki. In particular, each of claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 depends from independent claims 1, 14 and 27, and therefore each of these independent claims 1, 14 and 27 is also recited within claims 9, 10, 12, 22, 23, 25, 34, 35 and 37. Therefore, each of claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 also includes at least the limitation of a polarization direction of at least one color component out of the image light irradiated on the screen: parallel to a vertical cross section of the screen; parallel to a horizontal cross section of the screen; parallel to a plane including the image light irradiated on the screen and a normal of the screen.

Upon review of Shibazaki, Shibazaki merely discloses a projector having rays of light emitted from the light valve through the converging lens 13 converge at the primary focal point F1 and travel to the elliptical mirror 15 by which the light rays are reflected toward the secondary focal point F2 that serves also as the focal point of the parabolic mirror 17. As such, Shibazaki fails to disclose or suggest a polarization direction of at least one color component out of the image light irradiated on the screen: parallel to a vertical cross section of the screen; parallel to a horizontal cross section of the screen; parallel to a plane including the image light irradiated on the screen and a normal of the screen, and therefore Shibazaki fails to cure the deficiencies which exist in the combination of Shikama and Suzuki. Thus, Applicants respectfully submit that each of claims 9, 10, 12, 22, 23, 25, 34, 35 and 37 also recites subject matter which is neither disclosed nor suggested by Shikama, Suzuki and/or Shibazaki, for at least the reasons set forth above with respect to claims 1, 14 and 27.

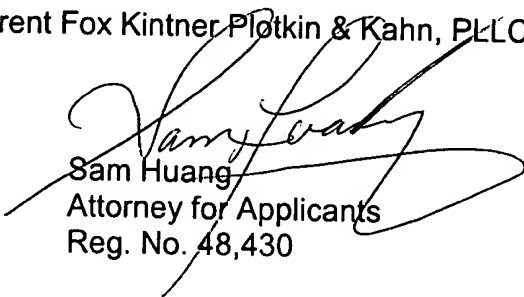
In view of the above, Applicants respectfully submit that claims 1-38 each recites subject matter that is neither disclosed nor suggested in the cited prior art. Applicants also submit that the subject matter is more than sufficient to render the claims non-obvious to a person of ordinary skill in the art, and therefore respectfully requests that claims 1-38 be found allowable and that this application be passed to issue.

Should the Examiner believe the application is not in condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, Applicants respectfully petition for an appropriate extension of time. The Commissioner is authorized to charge payment for any additional fees which may be required with respect to this paper to Counsel's Deposit Account 01-2300, referencing Attorney Client Matter No. 107336-00005.

Respectfully submitted,

Arent Fox Kintner Plotkin & Kahn, PLLC



Sam Huang  
Attorney for Applicants  
Reg. No. 48,430

Customer No. 004372  
1050 Connecticut Ave. NW  
Suite 400  
Washington, D.C. 20036-5339  
Tel: (202) 857-6261  
Fax: (202) 638-4810

SH/bgk